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ABSTRACT

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Storytelling, Technology and Children's Literacy Development

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Abstract

This paper reports on a project started November 1999, which aims at understanding the storytelling structuring processes put into action by children at primary education level. The ultimate goal of this study is to draft a script for a computer tool to support story telling.

For this purpose we identify narrative scheme as the main organizing paradigm of human thinking and the ubiquity of the products of narrative schemes for human life. We then consider the importance of the development of children's narrative competences and the role of narrative, particularly storytelling, for the development of literacy and imagination in the processes of learning and school performance.

A brief analysis of research within storytelling software development leads us to conclude that there is need for greater investment in this area.

Finally we describe the various research stages, emphasising Propp's contribution towards story analysis and the need to include children in technology design.

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Introduction

Narrative, particularly storytelling, has a fundamental role in our lives. In children, the development of narrative skills directly affects the development of other skills, namely cognitive, emotional and social ones.

Narrative practice and storytelling are seen, consensually, as essential activities for literacy development and are assumed as effective teaching methods. However, it still seems necessary to go against reductive views of the teaching/learning process, and this means understanding learning as «*an act of knowledge*» (Freire, 1985 cit. In Wishard, 1997:3) and requires the educator to attribute more relevance to students' experiences, making the learning material personally relevant to them. This becomes «*an invitation to make visible the languages, dreams, values (...)*» (ib., p. 4) that constitutes the lives of those whose stories are often actively silenced.

The school also has to take responsibility for supplying children's imagination and make it possible for them to express it, without refraining creative and expressive acts, believing that imagination should be repressed and dominated for the child to become an adult.

On the other hand, and in a society where much of the supplies for children's imagination come from the media, it is the responsibility of those who think the structure and contents of those media, to know and to understand children's needs. If the creative exercise in general, and storytelling in particular, seems to be one of preferred activities of the child, and if media, specially technological media, have the gift of fascinating children, they could both serve, fusing on a quality software for storytelling, to provide a useful, effective and meaningful support to children's real needs.

In this way, the development of this kind of software presumes, on one hand, that we must know and understand the underlying processes of children's storytelling and, on the other hand, that we must know and understand children as technology consumers. Who best to give us this information besides children themselves?

The narrative scheme

Human experience is embedded in a personal and cultural realm of non-material meanings and thoughts. This realm is not static: it is augmented by the new experiences that it continuously configures, as well as by its own reconfiguration process, that is undertaken by means of reflection and reorganization processes or, as Morin (1991) calls it, of auto-eco-organization, or also, in Piaget's (1963) perspective, by "assimilation" and "accommodation".

So, those systematic "representations" of our experience provide us, simultaneously, with an interpretation and a structure for our past and with an anticipation system of the future, by means of a capacity to use representative pre-existing "records" in imaginative creation of alternative scenarios that anticipate the consequences of our possible actions (Applebee, 1978; Polkinghorne, 1988).

Experience expands itself by the use of metaphoric processes that link similar experiences together, and make an evaluation of the "pieces" according to its meaning for the "whole". Narrative is amongst these metaphorical and polisemic aspects of the original processes because it works to produce meaningful experience (Polkinghorne, 1988).

The cognitive psychologist Jerome Bruner (1986) proposed that narrative understanding is itself one of two basic intelligences or ways of cognitive functioning, along with logical-mathematical reasoning, which he calls "paradigmatic". The two processes are different and each one uses a different type of causality to relate events. Paradigmatic intelligence seeks universal truth conditions and narrative intelligence seeks particular relationships between events.

The narrative ordering process works by linking the events along a temporal dimension through the identification of the effects that one event has on another, and it serves to coherently transform human actions and the events that affect human life in a temporal *gestalt*. Just like there is a limited number of *gestalt* operations that produce perceptually recognizable configurations, there also exists a limited number of narrative structures that produce coherent stories.

For this study in particular, it is not a pertinent question if the narrative scheme is an innate structure of conscious, like grammatical structures suggested by Chomsky (1966, 1972), a kind of universal and profoundly internal structure of human memory (Mander, Scribner, Cole & DeForest, 1980 cit. in Chandler, s/d), or a learned and stylised linguistic form, whose origins can be found in the cultural field of which the individuals are part of and, because of that, totally external to them.

What seems absolutely essential for this study is the notion that the organizational narrative scheme is particularly important to understand human activity (Polkinghorne, 1988). Narrative invents the plot that chain things and events, internal and external, and because of that, it is predominantly metonymic, selecting and articulating the personal and social paradigms that make daily life.

The pervasiveness of narrative

In fact, a large number of authors identify what some designate the "pervasiveness of narrative" (Polkinghorne, 1988; Engel, 1999). This term describes the ubiquity of products of narrative schemes in our lives: they are insidiously present in our personal, cultural and social environments.

We create narrative descriptions for us and for others about our past actions and we develop stories to make sense of the behaviours of others. We also use narrative schemes to construct imaginative hypothetical scenarios where we test our possible actions. On the other hand, we are constantly confronted with stories, during our conversations and our meetings with the different visual medias. We read books and watch movies.

Narratives are intimately and constantly present in our lives. Babies and preschool children often construct monologues while playing, when they go to sleep or are on their own, that seem to have that same organizing and integrative function of narrative schemes (Engel, 1999; Applebee, 1979). When they grow up, most of children playing activities are sustained by an implicit narrative or it generates narratives in the form of action descriptions, and children gradually listen to and tell a greater variety of stories.

Even when they do not use verbal language, when they draw, children tell stories. B. van Oers (s/d), describing the results of observing 5 and 6 year old children, refers that the iconic representations and drawings of children during this period have a narrative function. They do not only represent situations, they

represent a narrative. Sometimes, to make sure that all narrative elements are communicated, children write words or small phrases that, most of the time, refer themselves to the dynamic aspects of the situation and that they do not consider to be completely perceptible on the drawing itself.

Roland Barthes (1966, cit. in Polkinghorne, 1988), opens his "*An Introduction to the Structural Analysis of the Narrative*" with a paragraph about the centrality of narrative in people's lives:

«*(...) In the first place the word "narrative" covers an enormous variety of genres which are themselves divided up between different subjects, as if any material was suitable for the composition of the narrative: the narrative may incorporate articulated language, spoken or written; pictures, still or moving; gestures and the ordered arrangement of all the ingredients: it is present in myth, legend, fable, short story, epic, tragedy, comedy, pantomime, painting... (...), cinema, comic strips, journalism, conversation. In addition, under this almost infinite number of forms, the narrative is present at all times, in all places, in all societies; the history of narrative begins with the history of mankind; there does not exist, and never has existed, a people without narratives.*» (p. 14).

Barthes, as well as other authors (Rodrigues, 1978; Applebee, 1978; Campbell, 1988; Polkinghorne, 1988; Engel, 1999, among others) believes that narratives have meaningful functions, at the individual, cultural, social, anthropologic, cosmogonic, institutional and creative levels.

The development of narrative skills and its importance

As we have already emphasized, the are no consensual demonstrations that narrative skill is an innate capacity; however, whatever the explanation of its origins, it seems consensual that signs of narrative skills appear very early and in all cultures and that their development go along the general development of the child.

The adjustment of the specific organizational frames that give sense and drive our daily activities, or *scripts* (Schank & Abelson, 1977), or *schematas* (Bartlett, 1932), or narrative scheme, depends on the appropriate development of our narrative skills. Learning and appropriation of the inherent strategies of narrative skills is of capital importance to the child.

According to Polkinghorne (1988), the skills to understand the narrative ordering of events are gradually mastered by the child between the age of 2 and 10. Children learn to produce and understand causal and temporal structured plots that are organized around a variety of themes and involve certain characters. Besides that, they also develop the necessary skills to recognize when a plot makes sense or not.

Narrational discourse language presents itself as a constructor of the experience that describes and is a way for the child to learn about narrative form. Narrative language and the narrative thought that it modulates, have a special role in the integration of affection, cognition and action (Bruner & Lucariello, 1989).

In this integrative perspective, the narrative language or discourse is essential because of the vital functions it has for child development, namely:

[Know the world] Susan Engel (1999) suggests, recovering terms previously used by Bruner, that the narrative skills development allows children to master two levels of understanding: cold and hot. "Cold" knowledge means what we

usually call cognition and it refers to the way things work in the physical world, what comes first and what comes next, how people, things and actions are related. Understanding in the "hot" sense means the comprehension of feelings and emotional aspects.

Applebee (1978) and Engel (1999) refer themselves to Ruth Weir's book *Language in the Crib* (1962), where she describes the analyses of her son's monologues, recollected during the times he talked to himself just before sleep, every night between his 28th and 32nd months of age. His monologues, as Applebee and Engel suggest, may provide the firsts examples of narrational discourse language. Through those monologues children exercise not only language, but also the power of language as a things and actions organizing scheme, around a core that provides cohesion.

As children develop the skills to symbolically represent experience, pretend play becomes a prominent activity. Jerome Singer (1994) proposed that this kind of play, with its exploratory and repetitive characteristics, represent not only amusement but also an important critical characteristic of cognitive and emotional skills development. The author wants to show that, what Piaget (1962) has called *symbolic play* is not only a temporary characteristic of growth towards the logic emersion but also an intrinsically adaptive characteristic of human condition.

Pretend play serves the child not only to have fun and amusement but also to assimilate world complexities. In this complex kind of play, the child elaborates roles and action plans and transforms objects in order to express her ideas and feeling about the social world (Garvey, 1984).

[Know the world emotionally] Engel (1999) suggests that children also use narrative in order to obtain an emotional knowledge of themselves and people around them. In the author's opinion, the narrative cognitive and emotional functions do not occur separately. On the contrary, we deal with our emotional problems through cognitive activities like rearrangement, symbolization and perspective taking. Narratives are an effective way of obtaining an emotional knowledge of the world partly because of their "cold" function. As any psychoanalysis patient can attest, to talk about something can make us revive that experience and bring to consciousness the feelings associated with it. The feeling that we have created a kind of emotional distance can explain why children love stories about things that they, certainly, will hate to experience – loss, fear, rejection, etc.. In narrative, or in stories, just like in pretend play, we can experience those feelings without suffering their real consequences.

[Solving problems] Like Feldman (1989) refers, many times children build confused narratives that are a kind of cognitive puzzle on which they need to work. Frequently, they use logical inference terms, like *but*, *so*, *no* and *because* and terms that describe the state of their knowledge about things, like *maybe*, *probably*, *certainly*, on appropriate occasions, most of the times when they are trying to understand an event that is not very clear for them. The use of narrative to solve problems is not only useful when younger children are building, for the first time, a set of event representations or solving some basic problems of order and causality. As children grow up, they can use narrative form in larger contexts to solve more complex cognitive puzzles (Engel, 1999; Applebee, 1978).

[appropriate and become part of the culture] Language is the child passport to her culture. And if this is true for language in general, it is particularly true for narrative. Some authors are of the opinion that narrative has a certain kind of universality. According to White (1980, 1981) each community has its particularly way of making use of narrative skills, of telling stories. Bartlett (1932) has showed that remembering is a social process and that in a story-retrieving act (or retell), we transform it in order to reflect the way we think, that is moulded by the culture and sub-culture we live in. In this way, how a story is told reflects the belonging to a cultural community. If we tell stories conformed to what the community considers appropriate, our entrance in that culture will be easier and better succeeded. And this is equally true for adults and children. Children must penetrate the social world as a whole and master it.

On the other hand, children are daily exposed, from a very young age, to many kinds of narrative constructions: from conversations to stories they hear, cartoons on TV... Some studies have shown that, just like what happens with language acquisition, a lot of society input is of great importance for the development of children narrative skills and consequent capacity for storytelling (Engel, 1999).

[Make and maintain friendships] Narratives, especially those that concern personal experience, are a powerful tool to manage social relations. Through the narratives they construct, children present themselves to others. Studies have demonstrated that conversations between children who know each other are longer. This suggests that intimacy, shared experiences and knowledge lead to greater levels of conversational skills (Engel, 1999). One of the ways by which children develop this intimacy is through the narratives they share.

Understood as discourse or speech act (Ricoeur, 1979), each narrative has three components: narrative as it is transmitted, what the sender wants to get with the narrative and the effect that narrative has in the receiver. This framing helps us understand that people can use narratives to interact with and affect others.

[Construct the self] The cognitive psychologist Ulric Neisser (1988) refers that one of the ways through which we know ourselves is the construction of an extended self, that is the self that we imagine, figure and draw since the past and for the future. The way we behave, feel and experience grows up, partly, from the self that we construct from our past experiences and future expectations. We project ourselves inside very different possible experiences as a way to explore who we are and who we are not. Clearly, part of what we are is moulded by the person we imagined to be. When children construct narratives about who they could be, want to be, imagine to be, they are experiencing many of the other selves that are part of the whole they are.

[Inventing and adapting] According to Engel (1999), children tell stories not only to represent experience as they know it, as they know the others know it, but also to represent experience as they would like it to be. This is not simply a way of expressing profound wishes or fantasies. The act of remaking the world serves itself a function that goes beyond the expression of any unconscious desire. Narrative structure allows children to guide one another while they play, just like Wells (1986) has referred. The articulation of a narrative theme or plot helps them to assume roles and to agree on certain rules of what can happen according to the projected scenario. So, children use narrative structures to

invent and re-invent the world and the narrative act is, in this perspective, eminently creative.

Singer (1994) also considers that symbolic play is the foundation for the incorporation and consolidation, on a long term basis, of one of the greatest human characteristics: imagination, our capacity to formulate our experiences in narratives, to manipulate memory representations of our physical and social worlds into new scenarios. The author suggests that pretend play is the beginning point for the development of narrative skills.

Narrative refers to, describes and represents human actions and experiences. It amuses, teaches, convinces, evokes, controls, explains, justifies, clarifies... The narrative practice is, simultaneously, a product of the narrative schemes development process and a vehicle for the development, not only of the narrative schemes themselves, but of the human person as a coherent whole.

Narrative, Literacy Development, Learning Processes, Imaginary and School

Apart from all the children's life dimensions that are affected by narrative skills development, it seems that narratives in general, and storytelling in particular, have an important role on literacy development.

Applebee (1978) refers that the majority of the characters in stories became part of the "real world" that the child is trying to master. Those that we, adults, recognize as simple story characters are the beginning of what we can call the "literary" or "cultural" heritage of the child; they are the reference points that children can share with one another and with the world of adults.

The stories children listen to help them acquire expectations about the world, its vocabulary and syntaxes, as well as people and places, without the pressure of having to separate the real from the make believe. Even if they eventually learn that some aspects of this world are just fiction, the recurrent patterns of values, stable expectations about the roles and relations that are part of their culture, will remain (Applebee, 1978). It is exactly these underlying patterns, and not the witches or the giants that give them a concrete form, that make stories an important socialising agent, one of the many ways through which children are taught about values and standards. Besides this, a lot of what integrates the stories children listen to, namely their formal structures, characters, actions, places, etc., is incorporated into a system of expectations of what a story is, a system that reflects itself in the stories children tell. And maybe we can identify this system as the "literary" or "cultural" heritage that Applebee talks about.

In his book, *The Meaning Makers* (1986), Gordon Wells argues that literacy is essential to school success and has its origins during the first years of life. In Wells' opinion, the act of sharing stories is one of the most important activities for the construction of literacy.

On the other hand, teachers and researchers in Education consider storytelling as one of the most effective teaching methods (McEwan & Kieren, 1995). Many authors state the pedagogical and developmental advantages that can be obtained through the use of tales or stories in the educational process, namely to the development of imagination, observation and children's memory, to the increment of knowledge and experience, to the logic of thought and the affectivity of the child (see Traça, 1992; Glos & Umaschi, 1999).

Storytelling allows children to develop their linguistic and narrative skills (Auwarter, 1986), aspects that are going to be essential to the school success of the child. Besides this, as a deliberate act of fictionalisation, storytelling gives shape to children's imaginary, that tends to be prolix or diffuse and fugacious, endowing it with a certain kind of concretism and "determinacy" (trad. as sic.) (Amarilha, 1996, p. 2). The child, exercising this decentralizing and distancing movement of extending beyond herself and experiencing others that are part of her imagination – assigning them certain actions and conferring them a spatial-temporal framing – learns the enjoyable syntax of fiction (Oliveira, 1975).

Expression activities promote the double task of assimilation and accommodation to the world, satisfying the need to transmit the child's inner world to others, and to receive from them new stimuli (Gloton & Clero, 1976). Helping children's symbolic imagination development and making available a place to exercise it, narrative activities in general, and storytelling in particular, prepare the way for abstract thought development and deeper mental processes (Nicolopoulou, 1996).

It seems that those expressive activities, like pretend play, storytelling or other kinds of narrative expression, start to be neglected when the child goes to school. What is privileged in kindergarten is now either not very much explored, or it just serves as entertainment between activities considered more important. Nor is the final product given the consideration it deserves and that the child expects to receive because of her need to share the product of her creative actions. It seems absolutely important that schools reserve time, dedication, space and materials for child expressive and creative activities, ascribing them an equivalent importance to the study of verbs or the resolution of math problems.

On the other hand, it seems equally consensual that children feel more involved in the learning process when they are producing artefacts where they can see themselves reflected and that they can share with others (Harel & Papert, 1993). This also contributes to a better self-image, a fundamental aspect for the healthy development of children and of their relationships with others (Damon & Hart, 1988).

Design of storytelling software

Nowadays, almost all software for children is incredibly sophisticated and quite attractive. However, most of it is not consigned to child storytelling support, not even, most of the times, necessarily empowering them to express and create or co-create, to use their imagination (Ryokai & Cassel, s/d).

At a commercial level, the kinds of software available tell stories to children, encourage them to learn how to read by providing excerpts from children's literature, allow them to illustrate stories or fill in the blanks in partially written stories, provide them a kind of pseudo authoring environment where children can chose some texts or characters to build stories, or allow children to illustrate stories that they make using word processors (Ryokai & Cassel, s/d; Umaschi & Cassel, s/d).

To date most of the research in computers and storytelling has focused, specially, on entertainment, namely interactive games, simulations and interactive fiction (Don, 1990; Laurel, 1993 cit. In Glos & Umaschi, 1999).

In education, researchers have devoted extensive effort to the development of storytelling software. For example, *MOOSE Crossing* (Bruckman, 1997) allows

children to construct a virtual environment where they can interact with one another, design and build the virtual objects and characters in the virtual space themselves. Each object and character has different behaviours when interacting with human participants and children are encouraged to write narratives about what they build on the screen.

Hayes-Roth's (1996) *Improvisational Puppets System* provides an environment where children can play by using personality-rich characters. Through the manipulation of the characters on the screen, just like real puppets, children can explore different actions and reactions.

The *MIT Media Laboratory*, namely the research group *Gestures and Narrative Language*, has been investing great effort in investigating and developing storytelling software. Montford (1998) has designed *EddieEdit*, a conversation digital character to aid children in the story writing process. Annany and Cassel (s/d) developed *The Reflectory*, a new interface, sized like a book, that allows children to access educational contents through storytelling – the system combines traditional artefacts, like letters and biographies, in a personal object and an interaction process, that the researches believe to encourage storytelling processes, active meditation and language development. *Renga – the cyberstory* (Cassel, s/d), was first used worldwide in October 1995, as part of the MIT Media Laboratory tenth anniversary celebration – the story was collaboratively written by 10 years-olds from more than 40 different schools in 11 countries.

The most recent projects of the research group implement a new interface generation, supported by *tangible media* and *computer-augmented toys* concepts. These studies have assumed the compromise to join the physical and the digital worlds, building an apparent inexistence of boundaries between the two, fusing the advantages of these two worlds. The interface design area is moving from *graphical user interfaces* to *tangible user interfaces* – from mouse and keyboard to ubiquitous computation and tangible media (Ishii & Ullmer, 1997).

On the other hand, the *computer-augmented toys* concept lay in the idea that children establish very intimate relationships with their toys and dolls. Those function as "transactional objects" (Winnicott, 1971), with which children feel tempted to communicate and relate to in a deep way. This tendency, researchers believe, can be optimised through the attribution of digital skills or characteristics to toys for them to provide adequate linguistic and non-linguistic feedback. In 1987, Allison Druin started to explore this concept and built a large soft toy (animal) named *Noobie*, which is digitally augmented.

There are good examples of meaningful projects in this area. *Rosebud* (Glos & Umaschi, 1999) links children' stories with soft toys, in a way that toy and computer augment themselves mutually; the project uses the natural characteristics of soft toys, namely their story evocative and appealing nature. *SAGE, Storyteller Agent Generation Environment* (Umaschi, s/d) is an authoring tool that allows children to design their own storytellers, with whom they can interact and whose goal is to make children explore their internal world as well as learn about storytelling and technology. To facilitate emotional relations and to explore the integration of physical and computational interfaces, *SAGEs* are embedded in interactive soft toys.

Storytelling seems to be a way of playing that is especially attractive to children and can serve, if good quality software exists, to introduce children to a technological world that can go beyond simple technological sophistication. On the other hand, children can be left as passive consumers of adult conceptions of childhood (Umaschi, s/d), which can lead to play dominated by the toy, and to software dominated by the computer.

In this perspective, it seems urgent to invest in developing technologies to encouraged children creativity and that allow children to dominate the processes – they feel powerful when they know they can create and control their play, toys and materials (Papert, 1980). Besides, as children emerge as important technology consumers, the existence of a useful, effective and meaningful support to children's real needs is critical.

The study: Understanding the structure of the stories children tell to design, cooperatively with the children, storytelling software

Understand what underlies children's storytelling activities can be very important to provide them with new devices, techniques and media by means of which their skills, gifts and inspiration can always find new ways of expression and development.

Although children's storytelling activities have been studied by researchers of many different domains, it seems that the interest has been concentrated on story contents from a psychological or psychotherapy point of view. The underlying structure of children's stories is still quite under-studied.

The study described in this paper stems from the idea that the better we can understand children as people and technology consumers, the better we can satisfy their needs. This way, the goals of this study are to understand the dynamics and the processes of story structuring by 6-10 year-old children and, on the other hand, to understand children's needs as technology consumers, integrating them in the storyboard design of the software.

The great motivation for this investigation concerns the fact that, although there has been an effort to help children think differently about sciences and maths (Harel & Papert, 1993), far less work has been done to understand how to design technological tools that help children learn about themselves, language, narrative and storytelling, providing them expressive devices according to their needs and wishes. The software that will be projected as a result of this study, in storyboard form, aims at being a support for children's exploration of aspects related to their narrative skills and, at the same time, use children's knowledge about storytelling to introduce them in the world of technology.

The study will have four stages: pre pilot study, pilot study, main study and development of the storyboard.

The contribution of Propp's structuralist theory and the three firsts stages of the study

In the context of structuralism, the work of Vladimir Propp (1992, trad.) assumes great importance.

Folk tales, fairy tales or marvel tales, with similar structural characteristics, have always been an apparent reality in many different cultures. The traditional explanation for this was that people have brought those tales, from one culture to another, and that in this transportation and integration into the

new culture they were submitted to certain kinds of content changes that configured them as particular to that culture. Propp considered this theory problematic and proposed, alternatively, the existence of a basic universal structure to explain tales similarity.

According to Propp (ib.), any tale, oral, written, mimed or imagistic, can still be identified as similar from the plot point of view. He tries to establish dramatic archetypes – he stands for the criterion of narrative functions, independent from the characters that perform them and from their modalities and also for the method of relationships between the constant elements of the tale.

Propp defines as the criterion to distinguish and classify minimal narrative units the characters' actions, which he calls Function. Characters' actions integrate themselves directly in the narrative plot and are independent from the characters that perform them, as well as from the way they are performed. In fact, a character can perform many functions throughout the plot, and a single function can be performed by different characters (ib.).

At the end of an accurate work where Propp analyses one hundred Russian tales, he found 31 Functions, characterized by linear sequentiality according to an unaltered order. The segmentation proposed by the author consists in delimiting and naming each of the functions. But only the modelling of function relations allows the true understanding of the narrative system. Propp suggests this modelling indicating the way in which the function sequences articulate themselves according to different schemes (ib.).

The stories children tell, impregnated with personal, cultural and social dimensions could reflect those latent plots, the texture of shapes modelled by an immanent matrix (Rodrigues, 1978). The methodology and morphology proposed by Propp seems to us a powerful tool for a structural approach to children's storytelling.

The pre pilot and the pilot study will fundamentally serve to test the adequacy of the research techniques and instruments, namely the clinical interview and direct observation. In the main study we will work with a group of 32 children, from 6 to 10 years of age, with Portuguese as mother tongue, attending a primary school in the region of Aveiro, Portugal.

Each child will be asked, in two different interview moments, to tell us a story, using a set of materials such as toys, dolls, clothes, etc., and using no materials. The stories will be analysed according to a model build upon Propp's theory. We want to account for the following questions:

- In story construction (deliberately and creatively created stories) do children use the narrative sequences and function sequences proposed by Propp's theory?
- Can structural proximity or distancing of children's stories towards Propp's theory, in both contexts (manipulation and non-manipulation of materials), be equated with differences in age, sex, socio-cultural background and upbringing (urban vs rural)?

The fourth stage of the study: involving children in the design of the software

Children have their owns likes and dislikes, curiosity and needs that are not the same as their parents' and teachers'. Although this seems quite obvious, children technology designers some times forget that children are not "small

adults" but completely different users, with their own culture, rules and complexities (Berman, 1977, cit. In Druin, 1999).

Druin refers that it is also very common for designers to ask parents and teachers what they think children need, rather than ask the children directly (Druin, 1999; Druin, 1996). Why this happens is not the question of interest to this study. What we think to be essential is to emphasize the fact that children do not have opportunities to express their ideas and opinions. And, as we know, children can be extremely honest and incisive in the feedback they provide (Druin, 1999).

In the Human-Computer Interaction community, there is a short but rich history of developing and sharing communication paths between users and technologists. However, this history is much shorter and less developed concerning children. Druin does a very complete description of the different roles assumed by children, throughout time, in technology design processes, culminating in what Druin calls "*children as our technology design partners*" (Druin *et al.*, 1999, cap. 3, p. 51). Here, children integrate technology research and design processes because it is believed that they possess extremely useful points of view and experiences.

The research work undertaken by Druin *et al.* (1999) provide us with access to important information regarding two essential processes for technological tools development: what children want or expect from technology and the kind of comments that children make about technology; besides this, provide us with an effective methodology to integrate children in the storyboard development process.

In this fourth stage of the study, we will constitute a small group of 3-4 children to integrate the storyboard development team. This stage of the study will be divided in two sub stages, adapted from Druin's *et al.* (1999) methodological proposal:

a) At a first stage, children will access different types of technological tools, such as Mac's, PC's, scanners, printers, digital cameras, internet access, digital graphical tablets, etc. and a variety of software, such as games, storytelling software, drawing software, word processors, etc., for researchers to observe children using the technology and software, to check their preferences, ways of use, usage patterns etc., and to collect children's opinions concerning the software they used, namely what they liked most, less, which aspects they would change, etc.

b) At a second stage, children will integrate, along with the researcher, sessions to build low-tech prototypes of a storytelling software, brainstorming sessions, and discussion sessions of the prototypes developed and ideas suggested by children and researcher.

We hope that this conjoined work between children and researcher and the conclusions of the main study will bring the storyboard to life. We assume this investigation as a way to bring the children's "real world" inside the "design world" of technology.

Conclusion

On investing in such a project we believe that, supporting children's creation of their own story structures, they will become more aware of the meta-communicative clues that sign the goals of certain written or told stories and of the communicative, emotional, cultural and social processes that we establish with ourselves and with others. We also believe that children need rich and flexible expressive media that allow them to exercise their creativity and materialize their imaginary.

On the other hand, as we live surrounded by technology, technological fluency is needed in many aspects of our daily lives. Supporting the creation of technology that is appropriate to children's specifications we hope they will become more educated consumers and creators and that, in the future, fewer adults become frightened by what technology represents. We believe that technological tools and environments that reflect one's internal world will not only develop children's ideas about themselves but also that ideas will develop the surrounding technology.

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